# ASSIGNMENT 4

Textbook Assignment: "Antisubmarine Warfare," chapter 4, pages 4-1 through 4-17.

4-1. Sonar is an acronym derived from using the first letters of what terms?

1. Sound, Navy, return
2. Sound, naval, rate
3. Sound, navigation, ranging
4. Sound, NAVAIR, range

4-2. Echo-ranging sonar relies on the reception of an echo to determine what information about a target?

1. Range only
2. Bearing only
3. Range and bearing only
4. Range, bearing, and frequency

4-3. What type of sonar does NOT transmit sound, but functions by receiving sound from the target?

1. Active
2. Passive
3. Reverberation
4. Return

4-4. A high-pressure area occurs in the water next to a hydrophone each time the hydrophone moves in what direction?

1. Inward only
2. Outward only
3. Upward only
4. Downward only

4-5. The high-pressure area in a sound wave is known as a

1. depression
2. rarefaction
3. compression
4. wavelength

4-6. The low-pressure area in a sound wave is known as a

1. depression
2. rarefaction
3. compression
4. wavelength

4-7. The wavelength of a sound wave is equal to the distance between two successive

1. rarefactions only
2. compressions only
3. rarefactions or compressions
4. diaphragm vibrations

4-8. The frequency of a sound wave is defined as the number of which of the following item that occurs in 1 second?

1. Wavelengths
2. Compressions
3. Rarefactions
4. Depressions

4-9. Absorption of sound waves in the ocean is least during which of the following water conditions?

1. White-capped waves
2. Smooth sea surface
3. Ship's wake
4. Riptides

4-10. Absorption of sound waves in the ocean is greatest during which of the following transmissions?

1. Low frequency
2. High frequency
3. Low amplitude
4. High amplitude

4-11. Foreign matter in seawater includes which of the following items?

1. Silt and animal life only
2. Animal life and seaweed only
3. Silt and seaweed only
4. Silt, animal life, seaweed, and air bubbles

4-12. Sonar transmission losses can be caused by

1. low-frequency pinging signals
2. low transducer power output
3. high foreign matter content of water
4. weak pinging signals

4-13. Assume that the crew on a destroyer which was conducting passive sonar operations, witnessed a surface mine explosion at a distance of several hundred yards. If the sonar equipment detected the sound 4 seconds after the explosion, approximately how many seconds were required for the sound traveling through the air to reach the crew?

1. 1 sec
2. 8 sec
3. 16 sec
4. 4 sec

4-14. What is the effect on a sound wave traveling in the ocean when the wave strikes the sea surface?

1. Downward reflection
2. Downward refraction
3. Upward reflection
4. Upward refraction

4-15. At what angle must a sound beam strike the side of a submarine to produce an echo?

1. 180°
2. 90°
3. 45°
4. 0°

4-16. Of the following surfaces, which one will cause the LEAST amount of reflections?

1. Calm sea
2. Rough and rocky bottom
3. Sandy bottom
4. Soft and muddy bottom

4-17. Most individual sound reflections are sharp and clear, but vary in intensity. Why does reverberation appear as a continuous sound?

1. The sound waves are reflected at different intensities from various objects
2. The individual reflections intermingle, and set up sound waves of different speeds
3. The individual reflections occur at different distances from the sonar, and arrive at different times
4. The sound waves are reflected at different frequencies from various objects

4-18. Which of the following conditions will cause the greatest amount of reverberation in deep water?

1. A smooth ocean surface
2. A sudden change in water density
3. Choppy waves on the surface
4. A sandy ocean bottom

4-19. The factor that will most likely determine maximum sonar range when sound propagation conditions are ideal is

1. absorption
2. refraction
3. reverberation
4. divergence

4-20. Varying temperature differences in the ocean have which of the following effects on a sound beam traveling therein?

1. Bends and distorts only
2. Splits and distorts only
3. Bends and splits only
4. Splits, bends, and distorts

4-21. The bending of a sound beam when it passes from a medium of given temperature to a medium of different temperature is known as

1. refraction
2. deflection
3. reflection
4. diffraction

4-22. An increase in refraction of a sonar sound beam has what effect, if any, on the range of the sonar?

1. Increases range only
2. Decreases range only
3. Increases range initially, then decreases it
4. None

4-23. Relative to propagation of sound in the ocean, which of the following statements is correct?

1. Speed is affected by salinity, pressure, and temperature
2. The higher the temperature, the lower the speed
3. Refraction increases effective range
4. Sound bends toward higher temperature

4-24. What is the density of seawater per cubic foot?

1. 6.24 lb
2. 6.40 lb
3. 62.40 lb
4. 64.00 lb

4-25. The effect of pressure on a sound wave in the ocean tends to bend the wave in what direction?

1. Upward only
2. Downward only
3. Upward or downward

IN ANSWERING QUESTIONS 4-26 through 4-28, SELECT THE TEMPERATURE CONDITION FROM COLUMN B THAT IS MOST CLOSELY RELATED TO EACH OF THE OPERATING CONDITIONS LISTED IN COLUMN A. NOT ALL RESPONSES IN COLUMN B ARE USED.

| | A. OPERATING CONDITIONS | B. TEMPERATURE CONDITIONS |
|---|---|---|
| 4-26. | Unusual condition that results in upward refraction | 1. Positive thermal gradient |
| 4-27. | Sound refracted downward because temperature decreases with depth | 2. Thermocline |
| | | 3. Isothermal |
| | | 4. Negative gradient |
| 4-28. | Even-temperature water throughout operating area | |

IN ANSWERING QUESTION 4-29, REFER TO FIGURE 4-4 IN THE TEXTBOOK.

4-29. The isothermal and cool water conditions shown in the figure have what effect, if any, on the sound beam?

1. Causes the beam to bend upward only
2. Causes the beam to converge on the target
3. Causes the beam to split, bending part upward and part downward
4. None

4-30. The definition for layer depth is the depth from the ocean

1. surface to the top of a sharp positive gradient
2. surface to the top of a sharp negative gradient
3. bottom to the top of a sharp positive gradient
4. bottom to the top of a sharp negative gradient

4-31. When positive gradient conditions exist in the ocean, layer depth is defined as the depth of which of the following temperatures?

1. Minimum temperature
2. Maximum temperature
3. Optimum temperature
4. Relative temperature

4-32. Which of the following cruising maneuvers by a submarine should prove most effective in causing a surface vessel to lose contact with the submarine?

1. Cruising in a uniform temperature area
2. Cruising above layer depth
3. Cruising below a thermocline
4. Cruising in an isothermal layer

4-33. A car is waiting at a crossing for a train to go by. The driver of the car honks the horn as the train approaches. After the train passes the crossing, the engineer on the train blows the whistle. How will the sound of the car horn heard by the train engineer compare to the sound of the whistle heard by the car driver?

1. The horn will sound lower than it actually is, and the whistle will sound higher than it actually is
2. The horn will sound lower than it actually is, and the whistle will sound lower than it actually is
3. The horn will sound higher than it actually is, and the whistle will sound higher than it actually is
4. The horn will sound higher than it actually is, and the whistle will sound lower than it actually is

4-34. As a sound emitter moves away from a receiver, which of the following apparent changes will occur?

1. Only frequency will increase
2. Only wavelength will increase
3. Wavelength and frequency will increase
4. Wavelength will decrease

4-35. Which of the following sounds are rarely heard by the sonar operator?

1. Pings
2. Target echoes only
3. Reverberations only
4. Reverberations and target echoes

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IN ANSWERING QUESTIONS 4-36 THROUGH 4-39, SELECT FORM COLUMN B THE RELATIVE PITCH OF THE REFLECTED SOUND THAT IS MOST DESCRIPTIVE OF EACH OF THE MOTION CONDITIONS LISTED IN COLUMN A. NOT ALL RESPONSES IN COLUMN B ARE USED.

| | A. RELATIVE MOTIONS | B. RELATIVE PITCH |
|---|---|---|
| 4-36. | Sonar stationary, all signals received classed as reverberation echoes | 1. Higher |
| 4-37. | Sonar and target moving in opposite directions, and separating | 2. Lower |
| 4-38. | Sonar and target moving toward each other | 3. Same |
| 4-39. | Sonar and target moving abreast and in the same direction | 4. Undulating |

IN ANSWERING QUESTIONS 4-40 THROUGH 4-43, SELECT FROM COLUMN B THE COMPONENT OF THE SONAR SET THAT IS ASSOCIATED WITH THE FUNCTIONS LISTED IN COLUMN A.

| | A. FUNCTIONS | B. COMPONENTS |
|---|---|---|
| 4-40. | Displays target echoes on a CRT | 1. Dome control |
| 4-41. | Provides the pilot with digital range and bearing information | 2. Azimuth and range indicator |
| | | 3. Recorder |
| 4-42. | Energizes the reeling machine raise and lower sequence | 4. Bearing and range indicator |
| 4-43. | Displays target echoes on a paper chart | |

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4-44. In the event the hydraulic system fails in the cable reeling machine, the sonar set operator should activate what switch to raise the dome?

1. RAISE/LOWER switch
2. SEAT switch
3. TRAIL switch
4. AUXILIARY RAISE switch

4-45. What tool is provided the sonar set operator to manually retrieve lowered cable and dome in the event of an electrical or hydraulic failure?

1. Speed wrench
2. Block and tackle
3. Turnbuckle
4. Pulley arrangement

4-46. What is/are the function(s) of a hydrophone?

1. Sound transmission only
2. Sound reception only
3. Sound transmission and reception only
4. Sound transmission, reception, and inversion

IN ANSWERING QUESTIONS 4-47 THROUGH 4-49, SELECT FROM COLUMN B THE FUNCTION OF EACH OF THE PROJECTOR ASSEMBLY COMPONENTS LISTED IN COLUMN A. NOT ALL RESPONSES IN COLUMN B ARE USED.

| | A. COMPONENTS | B. FUNCTIONS |
|---|---|---|
| 4-47. | Projector | 1. Radiates directional pulses into the air |
| 4-48. | Fluxgate compass | |
| 4-49. | Pressure potentiometer | 2. Converts electrical pulses to acoustic pulses |
| | | 3. Provides a signal to indicate dome azimuth deviation relative to magnetic north |
| | | 4. Provides a signal to indicate how deep the dome is submerged |

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4-50. The stave assemblies in the hydrophone assembly function to

1. measure the temperature of the water
2. measure the depth of the dome in the water
3. convert acoustic signals into electrical signals
4. convert low-level ac signals Into acoustic signals

4-51. How often, if ever, must the hydrophone be adjusted?

1. Every 28 days
2. Every 56 days
3. Every 112 days
4. Never

4-52. The function of the dual cursor position control is to

1. determine the position of the cursor in range only
2. determine the position of the cursor in azimuth and range
3. apply a signal to control the direction in which the transducer will radiate
4. apply bearing and range information to the pilot's bearing and range indicator

IN ANSWERING QUESTION 4-53, REFER TO FIGURE 4-19 IN THE TEXTBOOK.

4-53. Which of the following components is NOT mounted on the front panel of the sonar transmitter?

1. FAULT indicator
2. CURSOR POSITION switch
3. POWER circuit breaker
4. STANDBY indicator

4-54. The SDC has which of the following functions?

1. Provides a digital readout of target range, speed, and depth
2. Processes and displays LOFAR, DIFAR, and CASS sonobuoy signals on the sonar set's CRT
3. Provides a digital readout of target size
4. Processes and displays LOFAR, DIFAR, and ASPECT sonobuoy signals on the sonar set's CRT

4-55. Which of the following modes is NOT classified as an operational mode?

1. PASSIVE
2. TEST
3. RANGE
4. ECHO-RANGING

4-56. Which of the following modes is NOT classified as a recording mode?

1. BT
2. TEST
3. COMM
4. ASPECT

4-57. When the sonar set is operating in ECHO-RANGING mode, the set presents target bearings by scanning (a) what number of sectors of (b) what size each?

1. (a) Four (b) 90°
2. (a) Eight (b) 90°
3. (a) Four (b) 45°
4. (a) Eight (b) 45°

4-58. The sonar operator can determine target bearing by noting the position of the target with respect to what part of the sector in which the target appears?

1. Top
2. Center
3. Bottom
4. Edge

4-59. The sonar operator can determine the nature of a target by noting which of the following features of the target?

1. Display outlines only
2. Audio quality and display outline
3. Range
4. Closeness to other targets

4-60. What information is displayed on the RANGE RATE-KNOTS meter?

1. Range and speed of the target within the cursor circle
2. Range and speed of all targets
3. Only the range of the target within the cursor circle
4. Only the speed of the target within the cursor circle

4-61. While operating in the PASSIVE mode, the operator notices a noise spoke on the CRT. What does the spoke indicate?

1. The CRT is burned
2. The hydrophore is malfunctioning
3. An underwater sound source is present
4. A nearby sonar set is operating in the PASSIVE mode

4-62. The sonar operator can use voice communications by moving the MODE switch to COMM position and activating the microphone by

1. depressing a switch on the microphone
2. turning a panel switch
3. depressing a foot switch
4. speaking into a voice-activated microphone

4-63. When the sonar set operates in TEST mode, system voltages and functions are sampled to see if they are within preset limits. How does the operator know when a preset limit is exceeded?

1. A special blip appears on the CRT
2. A fault indicator lights up
3. A sound is audible in the headset
4. A meter indicates the discrepancy

4-64. When the sonar set is operating in BT mode, the recorder plots temperature on what part of the moving chart?

1. Vertical axis
2. Horizontal axis
3. Left side
4. Right side

4-65. When the sonar set is operating in BT mode, the recorder plots dome depth on what part of the chart?

1. Top
2. Bottom
3. Horizontal axis
4. Vertical axis

4-66. The recorder RANGE mode provides which of the following indications?

1. A continuous digital display of target range
2. A series of range scale marks of target range
3. A strip-chart display of target range
4. A selectable digital display of target range

4-67. The recorder ASPECT mode provides which of the following indications?

1. A strip-chart display of target echoes of varying intensity
2. A strip-chart display of target echoes of constant intensity
3. A stylus sweep that draws the outline of the target on a chart
4. A stylus sweep that draws half of the target outline on one side of the chart and the other half of the target outline on the other side of the chart

4-68. Which of the following is a practical means of detecting a submerged submarine from an in-flight aircraft?

1. Detecting radio waves reflected from the submarine’s surface to the aircraft
2. Detecting acoustic waves reflected from the submarine’s surface to the aircraft
3. Detecting disturbances in the submarine’s magnetic field caused by interaction with the earth’s magnetic field
4. Detecting disturbances in the earth’s magnetic field caused by the submarine’s magnetic field

4-69. Magnetic lines of force are essentially undistorted in passing from water to air because both media have approximately the same

1. reactance
2. retentivity
3. permeability
4. dielectric strength

4-70. The angle of change in the east-west direction of the earth’s natural magnetic field is known as the

1. angle of variation
2. angle of incidence
3. entry angle
4. dip angle

4-71. The angle between a magnetic line of force and the horizontal of the surface of the earth is known as the

1. angle of variation
2. angle of incidence
3. entry angle
4. dip angle

4-72. MAD equipment is used to measure which of the following changes in the earth's magnetic field near a large mass of ferrous material?

1. Long-trace variation and dip angle
2. Short-trace variation and incident angle
3. Long-trace variation and incident angle
4. Short-trace variation and dip angle

IN ANSWERING QUESTION 4-73, REFER TO FIGURE 4-20 IN THE TEXTBOOK.

4-73. The dip angle at the North Pole comprises approximately how many degrees?

1. 45°
2. 90°
3. 135°
4. 180°

4-74. Which of the following conditions determines the amount of distortion a submarine will cause in the earth's magnetic field?

1. The submarine's alignment in the earth's magnetic field only
2. The submarine's magnetic qualities only
3. The submarine's latitude position on the earth's surface only
4. The submarine's alignment in the earth's magnetic field, magnetic qualities, and latitude position

4-75. The strength of the magnetic field of a submarine varies in which of the following ways with respect to the distance from the submarine?

1. As the square of the distance
2. As the inverse square of the distance
3. As the cube of the distance
4. As the inverse cube of the distance